sherlock
AUTOMATED DESIGN ANALYSIS™

Simulation Aided Box Level Qualification

NEPP Electronics Technology Workshop

9000 Virginia Manor Rd Ste 290, Beltsville MD 20705 | 301-474-0607 | www.dfrsolutions.com

DfR Solutions
RELIABILITY DESIGNED & DELIVERED

Problem Statement

Testing at box level may not exercise each of the components/boards in ways that expose weaknesses that are revealed in separate testing.

Overdeveloped test programs undermine the cost and time savings associated with box level qualification.

Reliability simulation of various states coupled with test verification may provide shortened test times and cost while providing assurance over a range of conditions.

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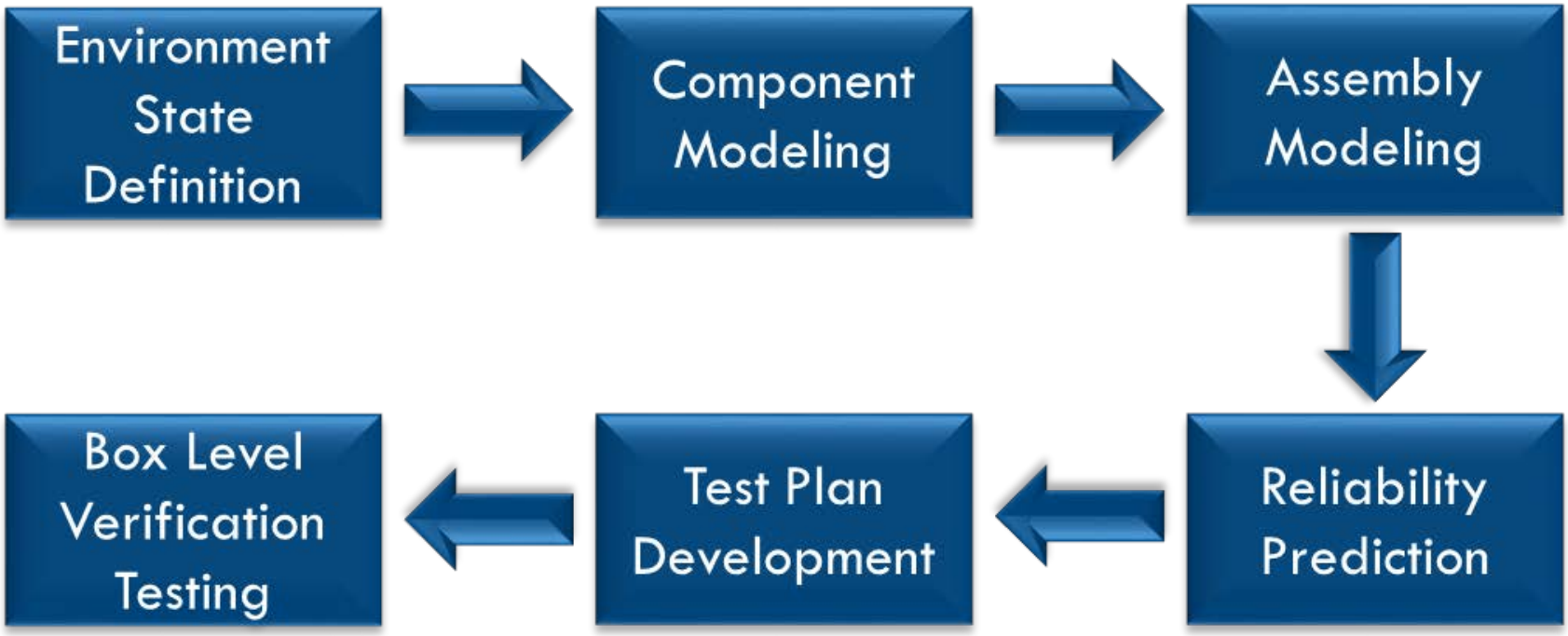
Proposed Simulation Aided Box Qualification Flow



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Environment State Definition

- Launch, Flight and Orbit profiles
  - Thermal and mechanical profiles
- Ground profiles
  - Extreme and nominal
- Power States
  - Definitions
  - Durations and Frequencies

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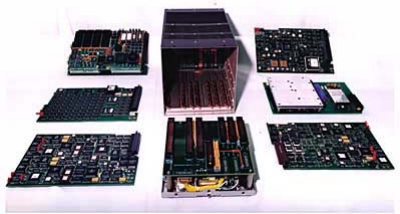
Know your design

- ODB files
- COTs Models
- Electrical Analysis

Understand internal states

- Housing Design Files



https://www.electronics-cooling.com/1999/09/design-and-reliability-considerations-in-avionics-electronics-packaging/

- Thermal Simulations

Define range of stresses

- Shock/ Vibe
- External Env.
- Internal Env.

Perform reliability simulations

- Reliability and Fitness for Application

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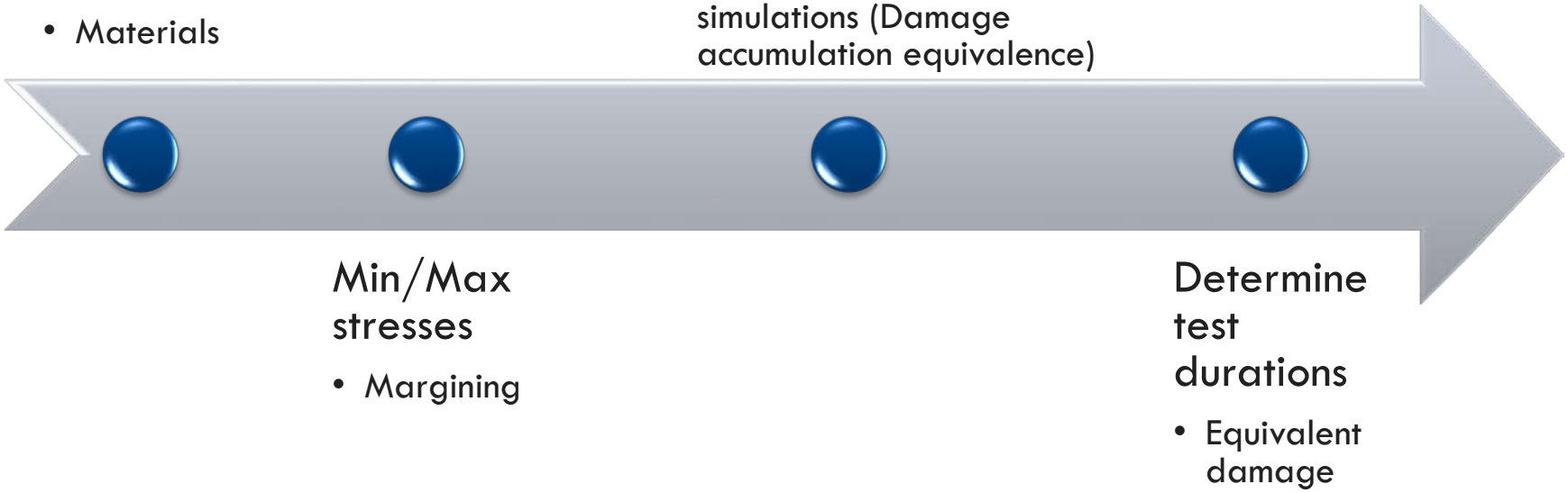
Test Plan Development



- Test plan review
  - Supplier presents test plan and justification for approval
  - Success definition

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Box Level Test Plan Execution

- Thermal
  - Power cycling
  - Environment cycling
- Mechanical
  - Housing design considered
  - Transmissibility
  - Mountpoint effects
- Analysis
  - Failure mode verification
  - Comparison with simulation results

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Verification and Reporting

- Provide simulation results of test conditions
  - Correlated with test results
  - Correlation validates the model assumptions
- Provide simulation results of range of mission environments

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Conclusions

- Simulation-aided box-level qualification provides an intermediate option to satisfy requirements

Box level qual testing → Simulation-aided box level qual → Component level qualification

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